REMARKS

I. Introduction

By the present Amendment, claims 5, 6, and 13-15 have been amended. No claims have been added or cancelled. Accordingly, claims 5, 6, 13-15 and 17 remain pending in the application. Claims 5, 6, and 13-15 are independent.

II. Office Action Summary

In the Office Action of April 20, 2007, claims 5 and 6 were rejected under 35 USC §103(a) as being unpatentable over U.S. Patent No. 6,950,215 issued to Fant et al. ("Fant") in view of U.S. Patent No. 5,859,936 issued to Ishikawa, and further in view of U.S. Patent No. 6,317,255 issued to Fatehi et al. ("Fatehi"). Claims 13-15 and 17 were rejected under 35 USC §103(a) as being unpatentable over Fant in view of Ishikawa. These rejections are respectfully traversed.

III. Rejections under 35 USC §103

Claims 5 and 6 were rejected under 35 USC §103(a) as being unpatentable over Fant in view of Ishikawa and Fatehi. Regarding this rejection, the Office Action alleges that Fant discloses an optical switching system configured by multi-stage connecting of a plurality of optical switching devices and that each optical switching device includes a plurality of monitors that detect light on a path transmitting an optical signal input to the optical switching device, and that the monitors each include an optical branching circuit as well as an optical detector that monitors the light. The Office Action admits that Fant fails to expressly disclose that the optical switching device includes a plurality of optical reflection monitors that detect reflected light on a path transmitting an optical signal input to the optical switching

device and locating positions of reflections on the path. The Office Action goes on to admit that Fant further falls to disclose that the optical reflection monitor includes an optical isolator that passes only the optical signal and blocks the reflected light, an optical branching circuit that separates the reflected light of the optical signal, and an optical detector that monitors the reflected light. The Office Action appears to rely on Ishikawa for disclosing these features. Specifically, the Office Action indicates that "however, it is known in the art to provide monitoring through tapping off reflected light to locate positions of reflection, as shown in Ishikawa (e.g., monitoring a reflected light in Fig. 6)." Applicants respectfully disagree.

As amended, independent claim 5 defines an optical switching system configured by multistage-connecting a plurality of optical switching devices. According to independent claim 5:

> each optical switching device comprises a plurality of optical reflection monitors with an optical reflection monitoring function, at least one of the optical monitors being placed on a path coupling the optical switching device with one of the other optical switching devices in multistage connection, and each of the optical reflection monitors detecting reflected light on a path passing through the multistage-connected optical switching devices so as to locate a position of reflection on the path, and
>
> each optical reflection monitor comprises an optical isolator that passes only the optical signal and blocks the reflected light; an optical branching circuit that separates the reflected light of the optical signal; and an optical detector that monitors the reflected light.

The optical switching device of independent claim 5, each optical switching device of the optical switching system includes a plurality of optical reflection monitors having an optical reflection monitoring function. As least one of the optical reflection monitors is placed on a path that couples one of the optical switching devices with another optical switching devices in the multistage connection. Each of

the optical reflection monitors detects reflected light on a path that passes through the multistage connected optical switching devices so as to locate the position of reflection on the path. Additionally, each of the optical reflection monitors includes an optical isolator that passes only the optical signal and blocks the reflected light, an optical branching circuit that separates the reflected light, and an optical detector that monitors the reflected light.

Regardless of the Examiner's contentions, the process of monitoring reflected light in Ishikawa and the instant invention cannot be considered just an obvious variation for the apparatus of Fant. In particular, Applicants note that the structure of the instant invention differs from that of both Fant and Ishikawa. The Office Action indicates that Ishikawa discloses monitoring of reflected light and directs reference to Fig. 7 and column 6, line 62 to column 7, line 25. The cited passage, however, merely describes the fact that Ishikawa provides a port failure communication controller that reports the error status information to an external alarm device. Further, the beam splitter (1b) of Ishikawa includes the port failure communication controller (30) to inform external supervisory equipment of the faulty port that has been detected. This passage, however, does not address the manner in which the optical monitor is arranged and/or the manner in which it operates. Ishikawa provides a plurality of photo diodes (PDa-PDn) that serve as optical sensing devices. These photo diodes are connected to the front end circuits of the reflection detection controllers.

Ishikawa specifically states "In case of trouble such as a cable break or plug disconnection, some part of the output light beam will be reflected at the fiber end face that is left open. Assume here that such a trouble has happened to the output

port A, for instance. The reflected light passes through the external modulator 20A and then arrives at the photo diode PDa via the additional optical path 16A. The photo diode PDa transduces the reflected light into an electrical signal." Clearly, the optical monitoring function is not performed by placing the optical monitors along a path that couples multiple optical switching devices in a multistage connection. This is illustrated in Figs. 1 and 7. Further, Ishikawa clearly indicates that the reflected light is only monitored after an optical cable has been broken and/or disconnected. Consequently, the system of Ishikawa is intended to detect the reflection of light that is reflected at the open end of the optical fiber cable that has either been broken or disconnected. This is to be expected, however, as one of the problems that Ishikawa intends to address is that of injury which can occur to the retina of a maintenance engineer if a fiber is broken. See column 1, lines 24-41. Consequently, the system of Ishikawa is focused on detecting reflected light which exits the broken end of the optical fiber cable.

In contrast, the present invention provides an arrangement wherein the optical monitor is placed along a path coupling two optical switching devices. When there is a reflecting point in the input port 455-3-1 of CB700-3 and reflected light is monitored in the optical reflection monitors 470-1-1 and 460-1-1, a value that indicates an abnormal condition is written into the optical reflection alarm control table. See page 13, lines 17-25, and Fig. 3 of the Specification. Additionally, it can clearly be seen that the optical reflection monitors 470-2-N are provided along the path that couples multiple optical switching devices. This configuration is clearly different from that shown in any of the applied references. Since the cited references fail to disclose, or even remotely suggest, all of the features recited in

independent claim 5, they cannot be construed as rendering the claimed invention obvious. More particularly, the art of record simply fails to provide any disclosure or suggestion for features recited in independent claim 1, such as:

> each optical switching device comprises a plurality of optical reflection monitors with an optical reflection monitoring function, at least one of the optical monitors being placed on a path coupling the optical switching device with one of the other optical switching devices in multistage connection, and each of the optical reflection monitors detecting reflected light on a path passing through the multistage-connected optical switching devices so as to locate a position of reflection on the path, and
>
> each optical reflection monitor comprises an optical isolator that passes only the optical signal and blocks the reflected light; an optical branching circuit that separates the reflected light of the optical signal; and an optical detector that monitors the reflected light.

It is therefore respectfully submitted that independent claim 5 is allowable over the art of record.

Independent claim 6 defines an optical switching system that is configured by multi-stage connecting a plurality of optical switching devices. According to independent claim 6:

> each optical switching device comprises a plurality of optical reflection monitors with an optical reflection monitoring function, at least one of the optical monitors being placed on a path coupling the optical switching device with one of the other optical switching devices in multistage connection, and each of the optical reflection monitors detecting reflected light on a path passing through the multistage-connected optical switching devices so as to locate a position of reflection on the path, and
>
> each optical reflection monitor comprises an optical circulator that allows the passage of the optical signal and circulates or blocks the reflected light of the optical signal, and an optical detector that monitors the reflected light.

The optical switching system of independent claim 6 includes, in part, at least one optical monitor that is placed on a path which couples the optical switching

device with another optical switching device within the multi-stage connection. See Fig. 3. As previously discussed with respect to independent claim 5, the art of record fails to provide any disclosure or suggestion for providing the optical reflection monitors along a path that couples multiple optical switching devices in the multistage connection.

It is therefore respectfully submitted that independent claim 6 is allowable over the art of record.

Claims 13-15 and 17 were rejected under 35 USC §103(a) as being unpatentable over Fant in view of Ishikawa. Regarding this rejection, the Office Action alleges that the combination of Fant and Ishikawa discloses all of the features recited in the claimed invention. The Office Action admits that Fant and Ishikawa fail to expressly disclose that the optical reflection alarm information is transferred from the optical switching device to the operation control unit after transmitting an optical reflection alarm acquisition requests to the optical switching device mounted on the selected circuit board by a CPU. Nonetheless, the Office Action indicates that requesting information from monitoring devices is a standard practice in the art. Applicants respectfully disagree.

As amended, independent claim 13 defines an optical switching method for enabling detection of reflected light. The method comprises the steps of:

> making a setting for switching an optical switching system composed of a plurality of multistage-connected optical switching devices and storing optical interconnection relationships indicating optical paths passing through the plurality of optical switching devices;
>
> making a selection of a circuit board on which optical switching devices are mounted according to a command from an operation control unit and storing optical reflection alarm information; and

locating positions of reflection in the optical switching system according to the optical interconnection relationships and the optical reflection alarm information being stored,

wherein the step of storing the optical reflection alarm information includes steps of:

transferring the optical reflection alarm information from the optical switching device to the operation control unit after transmitting an optical reflection alarm acquisition request to the optical switching device mounted on the selected circuit board by a CPU; and

updating the contents of the optical reflection alarm information being stored based on the optical reflection alarm information by the CPU.

According to the method of independent claim 13, a setting is made for switching an optical switching system that is composed of a plurality of multistage-connected optical switching devices and storing optical inter-connection relationships that indicate optical paths passing through the plurality of optical switching devices. Next, a selection is made of a circuit board on which optical switching devices are mounted according to a command from an operation control unit and optical reflection alarm information is stored. Positions of reflection in the optical switching system are located according to the optical interconnection relationships and the optical reflection alarm information that is stored. Furthermore, the step of storing the optical reflection alarm information also requires that the optical reflection alarm information be transferred from the optical switching device to the operation control unit after transmitting an optical reflection alarm acquisition request to the optical switching device mounted on the selected circuit board by a CPU. Additionally, the contents of the optical reflection alarm information being stored is updated based on the optical reflection alarm information.

Contrary to the assertions made in the Office Action, the cited references do not disclose all of the features recited in independent claim 13. As previously discussed, Ishikawa discloses an arrangement for detecting reflected light after an optical fiber has been broken and/or disconnected. Consequently, it is not possible to store optical interconnection relationships that indicate the optical paths passing through the plurality of optical switching devices. Furthermore, it is not possible for the cited references to locate positions of reflection in the optical switching system according to the optical interconnection relationships and the optical reflection alarm information being stored. More particularly, the cited references fail to provide any disclosure or suggestion for features recited in independent claim 13, such as:

> making a setting for switching an optical switching system composed of a plurality of multistage-connected optical switching devices and storing optical interconnection relationships indicating optical paths passing through the plurality of optical switching devices;
>
> making a selection of a circuit board on which optical switching devices are mounted according to a command from an operation control unit and storing optical reflection alarm information; and
>
> locating positions of reflection in the optical switching system according to the optical interconnection relationships and the optical reflection alarm information being stored,

It is therefore respectfully submitted that independent claim 13 is allowable over the art of record.

Independent claim 14 defines an optical switching method for enabling detection of reflected light. The method comprises the steps of:

> making a setting for switching an optical switching system composed of a plurality of multistage-connected optical switching devices and storing optical interconnection relationships indicating optical paths passing through the plurality of optical switching devices;

making a selection of a circuit board on which optical switching devices are mounted according to a command from an operation control unit and storing optical reflection alarm information; and

locating positions of reflection in the optical switching system according to the optical interconnection relationships and the optical reflection alarm information being stored,

wherein the step of locating the positions of reflection includes steps of:

detecting an alarm position according to the optical reflection alarm information that has been stored, when optical reflection alarm information is present;

searching the optical interconnection relationships being stored;

selecting a suspected abnormal optical interconnection path; and

after determining a rearmost connection among interconnected points at which reflected light occurs, notifying the operation control unit of the rearmost connection.

Independent claim 14 recites various steps that are somewhat similar to those recited in independent claim 13. For example, optical interconnection relationships are stored to indicate the optical paths passing through the plurality of optical switching devices. Furthermore, positions of reflection in the optical switching system are located according to the optical interconnection relationships in the optical reflection alarm information that is stored. As previously discussed, the art of record does not provide such features. Rather, the references provide an ability to detect reflected light after an optical cable has been broken or disconnected.

It is therefore respectfully submitted that independent claim 14 is allowable over the art of record.

Independent claim 15 defines a method of collecting optical reflection alarm information in an optical switching system. The system includes a system control

unit and a plurality of multistage-connected optical switch boards each of which includes an optical switching unit. A board control unit and a plurality of optical reflection mirrors are coupled to I/O ports of the optical switching unit so that at least one of the optical reflection monitors is placed on an optical signal path coupling the optical switching unit with one of the other optical switching units in the multistage connection. The method comprises the steps of:

> performing a settings for optical path switching in each of said optical switching units and storing information indicative of optical interconnection relationships between the I/O ports into a switching information register by each of said switching board control units in accordance with instructions from said system control unit;
>
> selecting one of said optical reflection monitors one after another by each of said board control units;
>
> determining status of an optical signal path passing through an I/O port coupled to said selected optical reflection monitor by comparing a monitored signal received from the selected optical reflection monitor with a predetermined threshold by said board control unit;
>
> setting status information indicative of the status of said optical signal path into an optical reflection monitoring register by said board control unit; and
>
> collecting said status information from each of optical switch boards by said system control unit.

According to at least one feature of independent claim 15, at least one optical reflection monitor is placed on an optical signal path that couples two optical switching units that are connected to each other. Additionally, the optical reflection monitors are sequentially selected by each of the board control units in order to determine the status of an optical signal path passing through an I/O port coupled to the selected optical reflection monitor. This is done by comparing a monitored

signal received from the selected optical reflection monitor with a predetermined threshold value by the board control unit.

As previously discussed, the art of record does not provide optical reflection monitors that are placed on the optical signal path coupling two optical switching units. Additionally, Ishikawa provides a reflection monitor that is intended to detect light emitting from a fiber cable that has been either broken or disconnected. Consequently, the cited references fail to provide any disclosure or suggestion for features recited in independent claim 15, such as:

> performing a settings for optical path switching in each of said optical switching units and storing information indicative of optical interconnection relationships between the I/O ports into a switching information register by each of said switching board control units in accordance with instructions from said system control unit;
>
> selecting one of said optical reflection monitors one after another by each of said board control units;
>
> determining status of an optical signal path passing through an I/O port coupled to said selected optical reflection monitor by comparing a monitored signal received from the selected optical reflection monitor with a predetermined threshold by said board control unit;

It is therefore respectfully submitted that independent claim 15 is allowable over the art of record.

Claim 17 depends from independent claim 15, and is therefore believed allowable for at least the reasons set forth above with respect to independent claim 15. In addition, this claim introduces novel elements that independently render it patentable over the art of record.

IV. Conclusion

For the reasons stated above, it is respectfully submitted that all of the pending claims are now in condition for allowance. Therefore, the issuance of a Notice of Allowance is believed in order, and courteously solicited.

If the Examiner believes that there are any matters which can be resolved by way of either a personal or telephone interview, the Examiner is invited to contact Applicants' undersigned attorney at the number indicated below.

Docket No. 520.41122X00
Serial No. 10/058,781
Office Action dated April 20, 2007

AUTHORIZATION

Applicants request any shortage or excess in fees in connection with the filing of this paper, including extension of time fees, and for which no other form of payment is offered, be charged or credited to Deposit Account No. 01-2135 (Case: 520.41122X00).

Respectfully submitted,
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Dated: August 20, 2007